THE STAKEVTZI GRANITE – GRANITOID MAGMATIC BODY OR MIGMATIC DOME

Philip Machev[1], Laslo Klain[1], Lutz Hecht[2], Ralf-Thomas Schmitt[2]

[1] Faculty of Geology & Geography, "St. Kliment Ohridski" University; e-mail: machev@gea.uni-sofia.bg
[2] Museum für Naturkunde, Humboldt University, Berlin; e-mail: Lutz.Hecht@museum.hu-berlin.de

Key words: Stakevtzi granite, deformation, mylonite

Introduction

The Stakevtzi pluton (Stakevtzi gneiss-granite) was described as a single magmatic body by Haydutov & Ivanov (1961) and Ivanov & Haydutov (1964). It was regarded as a part of the Stara Planina Ca-alkaline plutons (in the sense of Dimitrov, 1932) - magmatic products formed during the initial stage of evolution of the Paleozoic geosyncline (Haydutov, 1971), or during the inversion stage of evolution of the Balkanides (Dimitrova et al., 1975). All authors draw attention to the widespread high-grade metamorphic rocks (migmatites) around the pluton, which distinguish it from the other plutons across the area of Stara Planina Mountain. The formation of migmatites was related to the high-temperature contact influence (granitization and feldspatization) by the magma on the rocks of the Diabase-Phyllitoid complex (DFC) (Haydutov, Ivanov, 1961; Ivanov, Haydutov, 1964; Haydutov, 1971), or to the magmatic replacement of the same rocks (Dimitrova et al., 1964). Haydutov (1979, 1991) proposed a new mechanism of formation for the Stakevtzi pluton and migmatites from its mantle. According to this author, during the metamorphism of the DFC under greenschist facies conditions there were thermal domes with very high thermal gradient (over 100°C/km). In these areas the rocks of the DFC were metamorphosed under high-temperature conditions and were converted into different types of metatectites and diatectites. The melt generated during these processes was intruded into the low-grade metamorphics of the DFC, or into the migmatites. The age of the pluton was defined as Late Herzynian based on geological relations.

Petrology of the Stakevtzi granite

The Stakevtzi pluton crops out in the NW part of Bulgaria around the villages of Stakevtzi, Chuprene, Gorni Lom. It represents a strongly elongated body in NW-SE direction (about 100 km^2), extending westwards beyond the state boundary with Serbia. The axis of the pluton runs in NW-SE (120-125°) direction. Our field studies ascertain that the pluton was thrusted in NE direction over non-metamorphosed sediments (Stakevtzi Formation after Ivanov & Haydutov, 1964), DFC and sediments of Carboniferous and Permian age. The SW contact is transgressive (sediments of unknown age cover the pluton but they are strongly deformed, too.). The ophiolite complex (Cherni vrah Group after Haydutov, 1991) was thrusted over this complex (granite and sediments). This facts show that the Stakevtzi pluton is in allochtonous position and is part of the Berkovitza unit of the West Balkan zone (Ivanov, 1998). In general, these relations are presented on the geological map (Haydutov, 1995).

The aim of this study is to reexamine the problem about the origin of the Stakevtzi granite on the basis of new field, petrological and structural data. Our field investigations show that the Stakevtzi granite is an irregularly deformed magmatic body. The mineral lineation (L_m=115-155/10-40) was interpreted as primary flow direction by Ivanov & Haydutov (1964). The less deformed parts have massive to slightly schistose structure and they were described as Stakevtzi and Gorni Lom parts. (Haydutov, Ivanov, 1961; Ivanov, Haydutov, 1964). In this case the rocks have typical granitic texture and are built up of poorly zoned plagioclase (oligoclase-andesine), potassium feldspar (microcline), biotite, ± amphibole, quartz, zircon, allanite. Only quartz shows traces of deformation – its grains have undulose extinction and display partial recrystallization with deeply sutured grain boundaries. Discrete mylonitic to ultramylonitic zones up to 20 cm thick (Fig.1) are observed in the weakly deformed granite. Macroscopically, the contacts of these zones are sharp (Fig.1), but under the microscope, they are transitional. The quartz in these zones is strongly elongated and forms monomineral ribbons streamlined around the feldspar clasts.

The strongly deformed parts of the Stakevtzi granite have clearly schistose structure and they were described by different authors as migmatites or high

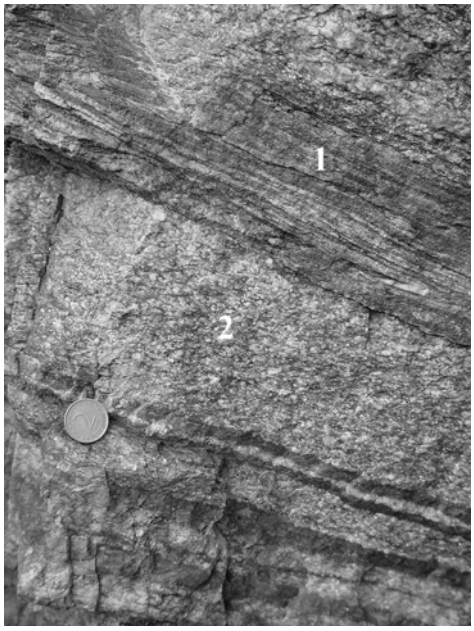

Fig. 1. Mylonitic zones (1) in weakly deformed Stakevtzi granite (2).

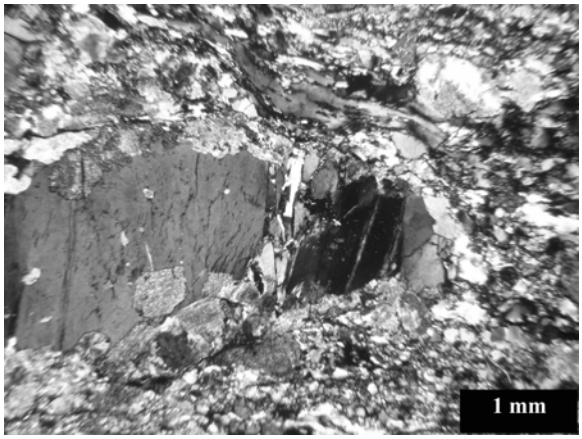

Fig.2. Texture of deformed Stakevtzi granite.

grade metamorphic rocks. Their contacts with the less deformed parts are transitional – in a narrow (3-5 m) zone the structure of the rocks changes from massive to schistose. The deformation took place under relatively low temperature (greenschist facies conditions). This fact explains the different behavior of the rock-forming minerals during the deformation. The feldspars (plagioclase and microcline) deformed in a brittle way – their crystals became broken up and rounded (Fig. 2). The cracks between the fragments were filled with recrystallized quartz. The feldspar clasts are stream-lined by quartz ribbons and chlorite. Nevertheless, the plagioclase preserved its magmatic zonation. The biotite is almost totally replaced by chlorite+epidote aggregates, or by white

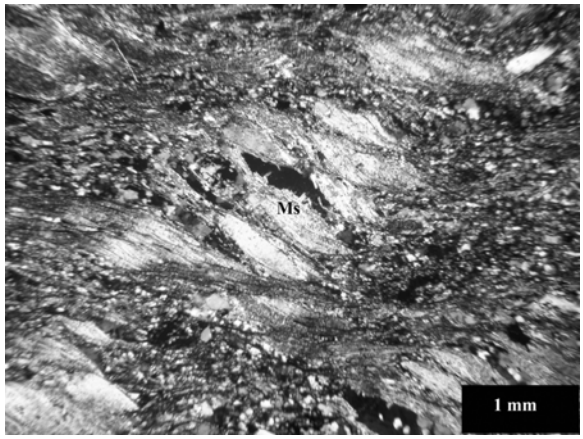

Fig.3. Texture of phyllonite, developed after Stakevtzi granite.

mica. These minerals build up bands of various lengths and form the foliation of the rocks. The quartz deformed in ductile manner and is now observed as strongly elongated grains (quartz ribbons) with deeply sutured grain boundaries. When the deformation took place in the presence of water-rich fluid phase, the granites were converted to phyllonites (Fig. 3). The latter are built up mainly of white mica and subordinate biotite and chlorite (from the sheet silicates), rare feldspar clasts, garnet and quartz ribbons. The presence of garnet in the phyllonites makes these rocks similar to orthoschists.

The Stakevtzi granite is Ca-alkaline, peraluminous with normative corundum and all samples plot in the VAG-field on the discrimination diagrams after Pearce et al. (1984).

Conclusions

All presented arguments and facts testify that that the Stakevtzi granite (or the Stakevtzi pluton) has magmatic origin. It represents a granitic pluton, irregularly deformed under greenschist facies conditions. No evidence was found to support the idea about the presence of high grade metamorphic rocks in this part of the Balkanides. On the contrary, the migmatites described by different authors are actually strongly deformed parts of the Stakevtzi granite, which was converted to mylonites and phyllonites. Because of the allochtonous position of the pluton, it is difficult to infer the time of metamorphism and deformation, and to answer if they were contemporaneous with the metamorphism of the DFC in the same facies conditions. An alternative suggestion is also possible – the Stakevtzi granite builds up a separate plate thrusted during Late Alpine

times over the DFC. In both cases, however, the granite must be older than the other granitic plutons across the Western Balkanides (Belogradchik, Sveti Nikola and Rajanovtzi plutons) - i.e. it is of Caledonian or Early Hercynian age (Z. Ivanov, personal communication).

Acknowledgments: The investigations were financially supported by the Fund for Scientific Research of the "St. Kliment Ohridski" University (Grant 3553/2004) and the cooperation between the Faculty of Geology & Geography and Museum für Naturkunde, Humboldt University, Berlin.

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СТАКЕВСКИЯТ ГРАНИТ – МАГМЕНО ТЯЛО ИЛИ МИГМАТИТОВ КУПОЛ

Филип Мачев[1], Ласло Клайн[1], Луц Хехт[2], Ралф-Томас Шмит[2]

Стакевският плутон е отделен като самостоятелно магмено тяло в началото на 60-те години на миналия век. За произхода му съществуват две хипотези. Първата, лансирана по това време предполага магматичен произход, като внедряващата се магма е оказала интензивно контактно въздействие върху скалите от диабаз-филитоидния комплекс (ДФК) и ги е превърнала в разнообразни мигматити. Според втората (Хайдутов, 1979, 1991) по време на метаморфизма на ДФК са съществували термални куполи с висок термичен градиент, който е предизвикал високостепенен метаморфизъм на част от скалите на ДФК, превръщайки ги в разнообразни мигматити. Образуваната при мигматизацията магма се е внедрила както сред нискометаморфните скали на ДФК, променяйки ги контактно, така и сред митматитите.

Проведените от нас изследвания показаха, че всъщност Стакевският плутон представлява неравномерно деформирано в зеленошистен фациес магмено тяло. В слабо деформираните участъци (около селата Стакевци и Горни Лом) са запазени първични магматични структури и текстури. Дори и в тях обаче се наблюдават милонитни зони с дебелина до 20 cm Във останалите части на плутона скалите са превърнати в разнообразни милонити до филонити. Именно милонитите са описвани като мигматити от мантията на плутона. Това ни дава основание да отхвърлим идеята за образуването на Стакевския плутон в резултат на присъствието на термален купол сред скалите на ДФК.

Тъй като плутонът има алохтонно положение – навлечен е както върху скалите от ДФК, така и върху карбонски и пермски седименти е трудно да се определи дали метаморфизмът и деформацията му са свързани с метаморфизма на ДФК. Най-вероятно Стакевският плутон е постар от останалите плутони (Белоградчишки, Раяновски и Светиниколски), разкриващи се в съседство с него.